1. Using the scenario below, model the population of bacteria α in terms of the number of minutes, t that pass. Then, choose the correct approximate *(rounded to the nearest minute)* replication rate of bacteria-α.

   A newly discovered bacteria, α, is being examined in a lab. The lab started with a petri dish of 3 bacteria-α. After 2 hours, the petri dish has 57 bacteria-α. Based on similar bacteria, the lab believes bacteria-α doubles after some undetermined number of minutes.

   A. About 28 minutes

   B. About 53 minutes

   C. About 169 minutes

   D. About 318 minutes

   E. None of the above

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2. Using the scenario below, model the population of bacteria α in terms of the number of minutes, t that pass. Then, choose the correct approximate *(rounded to the nearest minute)* replication rate of bacteria-α.

   A newly discovered bacteria, α, is being examined in a lab. The lab started with a petri dish of 4 bacteria-α. After 1 hours, the petri dish has 189 bacteria-α. Based on similar bacteria, the lab believes bacteria-α quadruples after some undetermined number of minutes.

   A. About 23 minutes

   B. About 10 minutes

   C. About 142 minutes

   D. About 64 minutes

   E. None of the above

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3. Using the scenario below, model the situation using an exponential function and a base of $\frac{1}{2}$. Then, solve for the half-life of the element, rounding to the nearest day.

The half-life of an element is the amount of time it takes for the element to decay to half of its initial starting amount. There is initially 852 grams of element X and after 3 years there is 121 grams remaining.

A. About 365 days

B. About 365 days

C. About 1095 days

D. About 1 day

E. None of the above

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4. A town has an initial population of 40000. The town's population for the next 10 years is provided below. Which type of function would be most appropriate to model the town's population?

Year	1	2	3	4	5	6	7	8	9
Pop	40046	40086	40126	40166	40206	40246	40286	40326	40366

A. Non-Linear Power

B. Logarithmic

C. Exponential

D. Linear

E. None of the above

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5. A town has an initial population of 60000. The town's population for the next 10 years is provided below. Which type of function would be most appropriate to model the town's population?

Year	1	2	3	4	5	6	7	8	9
Pop	59910	59730	59190	57570	52710	38130	0	0	0

A. Linear

B. Exponential

C. Non-Linear Power

D. Logarithmic

E. None of the above

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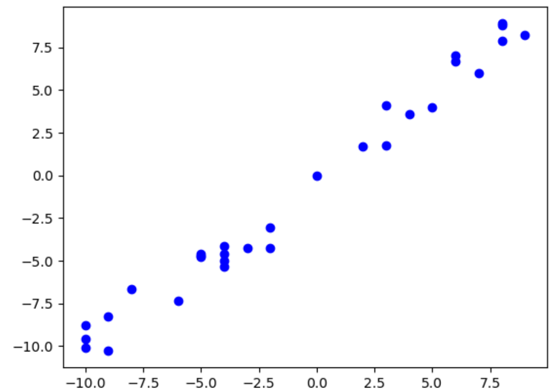
6. Determine the appropriate model for the graph of points below.



A. Logarithmic model

B. Exponential model

C. Non-linear Power model

D. Linear model

E. None of the above

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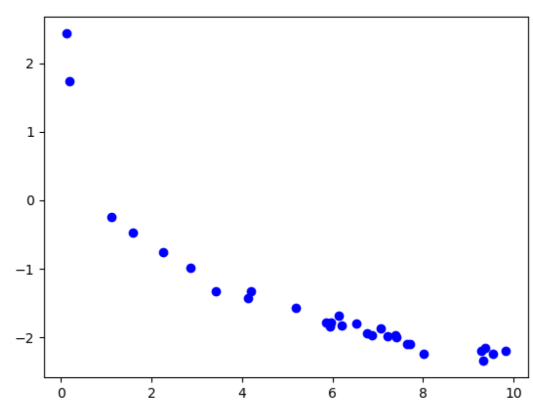
7. Determine the appropriate model for the graph of points below.



A. Linear model

B. Exponential model

C. Non-linear Power model

D. Logarithmic model

E. None of the above

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8. The temperature of an object, T, in a different surrounding temperature T_s will behave according to the formula $T(t) = Ae^{kt} + T_s$, where t is minutes, A is a constant, and k is a constant. Use this formula and the situation below to construct a model that describes the uranium's temperature, T, based on the amount of time t (in minutes) that have passed. Choose the correct constant k from the options below.

Uranium is taken out of the reactor with a temperature of 190° *C and is placed into a* 18° *C bath to cool. After 14 minutes, the uranium has cooled to* 143° *C.*

A. $k = -0.08865$

B. $k = -0.05610$

C. $k = -0.02991$

D. $k = -0.05521$

E. None of the above

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9. The temperature of an object, T, in a different surrounding temperature T_s will behave according to the formula $T(t) = Ae^{kt} + T_s$, where t is minutes, A is a constant, and k is a constant. Use this formula and the situation below to construct a model that describes the uranium's temperature, T, based on the amount of time t (in minutes) that have passed. Choose the correct constant k from the options below.

Uranium is taken out of the reactor with a temperature of 170° *C and is placed into a* 18° *C bath to cool. After 28 minutes, the uranium has cooled to* 130° *C.*

A. $k = -0.02746$

B. $k = -0.01091$

C. $k = -0.01490$

D. $k = -0.02797$

E. None of the above

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10. Using the scenario below, model the situation using an exponential function and a base of $\frac{1}{2}$. Then, solve for the half-life of the element, rounding to the nearest day.

The half-life of an element is the amount of time it takes for the element to decay to half of its initial starting amount. There is initially 964 grams of element X and after 5 years there is 137 grams remaining.

A. About 730 days

B. About 365 days

C. About 2190 days

D. About 1 day

E. None of the above
